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of describing an occasional condition as a typical one has been reduced to a minimum.

It is due to Miss FERGUSON to announce that the manuscript left her hands Dec. 29, 1902, after which only a few minor corrections in the latter part of the work were possible.—C. J. CHAMBERLAIN.

MINOR NOTICES.

THE FIRST PART of the second supplement (1896–1900) of the Kew Index, containing the letters A–L, is ready for distribution. It is printed uniformly in all respects with the *Index Kewensis* itself. The advantage of having such a record of the years 1896–1900 cannot be overstated, and the tremendous amount of labor it involves on the part of Sir W. T. THISELTON-DYER and his colleagues deserves recognition from botanists. The American Branch of the Clarendon Press is at 91–93 Fifth Avenue, New York City; and the price of the part is 13s.—J. M. C.

KOORDERS and VALETON[2] have published another fascicle of additions to the known arboreal flora of Java. The five families included are Fagaceae (Castanea 3 spp., Quercus 25 spp.), Lauraceae (71 spp., 10 of which are new), Monimiaceae (4 spp.), Coniferales (Podocarpus 5 spp., one new), and Casuarinaceae (2 spp.).—J. M. C.

NOTES FOR STUDENTS.

INSECTS AND FLOWER COLORS.—Before considering some very recent papers on this subject, brief reference may be made to the work of PLATEAU, who more than any other investigator, has raised objections to the familiar "flag" or "signal" theory, as held by SPRENGEL, MUELLER, and DARWIN. Among the more striking of PLATEAU'S observations,[3] we may note that he observed insect visits in normal number to heads of Dahlia, which were variously hidden from vision by means of leaves and papers; that the removal of the corolla from Lobelia flowers did not affect the insect visits, as claimed by DARWIN; that insects visit indifferently flowers of Salvia and Zinnia, similar in species but differing in color; that Pelargonium, however showy the flowers, is but little visited by insects normally, but that visits are readily induced in great numbers, if honey is placed on the flowers; that visits to Dahlia flowers cease if the nectar glands are removed, but begin again if honey is added; that the removal of the outer radiant flowers of Hydrangea has no effect on insect visits; that even such intelligent insects as bees commit many errors, visiting buds, wilted flowers, fruits, etc. In general it appears that PLATEAU'S views have become less positive; he held at first that color and form have no influence in attracting insects to flowers. At present, while all color preference is denied, and while odor and the presence of nectar are believed to be the most potent attractive agents, he seems not to deny altogether the possibility of color attraction. PLATEAU'S work has been accepted by but few students of flower ecology, and has been violently attacked especially by KIENITZ-GERLOFF.[4] PÉREZ,[5] while not calling PLATEAU'S results in question, thinks that his conclusions are too one-sided. He holds that odor attracts at a distance, but that color serves to give directional precision close at hand. FOREL[6] thinks that PLATEAU and other authors have given insufficient attention to the memory sense of insects.

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[2] KOORDERS, S. H., and VALETON, TH., Boomsoorten op Java. Bijdrage no. 10. Mededeel. 'sLands Plant. no. 68. pp. vi+287. Batavia. 1904.

[3] See Bull. Roy. Acad. Belg., 1895, 1896, 1897; Mém. Soc. Zool. France, 1898, 1899, 1900; Ann. Soc. Entomol. Belg. 1901, 1902; Bull. Roy. Acad. Belg. 1902. Reviews of these articles in Biol. Cent. **16**:417; **17**:599; **18**:469; **19**:349; **20**:490; **21**:650; **23**:224; **23**:311.

The immediate occasion for this review is the work of ANDREAE[7] and GILTAY.[8] ANDREAE begins his admirable treatise with the rather teleological statement that it is inconceivable that there should be so many showy flowers in the world, unless they are of some value to the plant, and that we cannot conceive of any use other than the attraction of insects! As the result of a great many ingenious experiments, he divides insects into two general groups: those with weak visual sense, short flight, and high odor sense; and those with opposite characters. The former group embraces lower forms for the most part, while the latter group, in particular, includes the Apidae and the higher Diptera. Thus, while many insects are attracted chiefly by odor, the bees and the higher flies are attracted chiefly by color. Bees tried to get inside of inverted glass vessels with flowers inside, while they paid little attention to open vessels with honey or perfume. A very gaudy artificial poppy had more visits than natural and less showy flowers, although it was observed that the insects soon learned to visit non-showy flowers containing honey and to avoid showy flowers that had no honey. Since the perception of odor is highly modified by direction of wind, moisture, and the presence of other odors, ANDREAE thinks that color is a much more reliable and effective attractive agent than odor.

The memory sense, touched upon by FOREL and ANDREAE, has been the special thesis for GILTAY'S work, and his work seems to harmonize the discordant results of PLATEAU and ANDREAE. A new line of experimentation is suggested by his work on *Papaver Rhoeas*, a species whose flowers are self-sterile; from one group the petals were removed and the flowers left free for insect visitation, another group was left in the normal condition and free for insect visitation, while a third group had the corollas removed and was hand-pollinated. Instead of noting insect visits, the seeds from an equal number of flowers of the three groups were weighed. The average for each fruit was 117^{mg} in normal insect-visited flowers, 115^{mg} in the hand-pollinated flowers deprived of corollas, and but 50^{mg} in the flowers deprived of corollas, which were left free for insect visitation. In other words a poppy with showy flowers produces more than twice as much seed as a poppy without showy flowers, when left free to insect visits. Thus GILTAY was at first led to doubt PLATEAU'S conclusions. However, further experiments produced a modification of his views, since it was noted that insects, and particularly bees, pay less and less attention each day to showy flower groups where no nectar is present, while they pay more and more attention each day to inconspicuous flower groups, where nectar is present. It would seem, then, that PLATEAU failed to see the earlier visits of his insects, or at least failed to discriminate in his results between the earlier and later visits, while ANDREAE, in general, seems to have concluded his experiments too soon.—H. C. COWLES.

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[4] See Bot. Zeit. **54**:123; **55**:84; **55**:108; **56**:138; Biol. Cent. **18**:417; **23**:557.

[5] See Act. Linn. Soc. Bordeaux, 1896; Mém. Soc. Sci. Phys. Nat. Bordeaux, 1903.

[6] See Zool. Jahresb. 1901.

[7] ANDREAE, E., Inwiefern werden Insekten durch Farbe und Duft der Blumen angezogen? Beihefte Bot. Cent. **15**:427–470. 1903.

[8] GILTAY, E.: Ueber die Bedeutung der Krone bei den Blüten und über das Farbenunterscheidungsvermögen der Insekten. I. Jahrb. Wiss. Bot. **40**:368–402. 1904.

SCHMIDT[9] defines the mangrove association as that made up of tree-like evergreen plants which live near the strand of sea and estuary where the ground is constantly or at regular intervals flooded with salt or brackish water. Owing to its peculiar development and mode of life this is the most characteristic and well defined association known. The English "tidal forest" or the Holland "vlordborsch" is suggested as preferable to mangrove association, the former expressing exactly what is characteristic of the formation. The Barringtonia association (Schimper) borders closely upon the mangrove. As a rule, however, they are quite distinct, the Barringtonia being found on a higher level where the tidal water does not reach.

Light plays an important part in determining the position of the leaves and branches. By placing ten leaves horizontal and ten others upright in the normal light of the mangrove forest it was found that disorganization of the chlorophyll took place in one-half to two minutes in the former, while after thirty minutes only a partial disorganization occurred in the latter. By assuming the vertical position the buds and leaves expose the least surface to the direct rays of the sun. The relative intensity of the light according to the exposure of photographic paper is for the open sea one-fourth to one-half second, in the mangrove two seconds, and in the inland jungle ninety seconds. Hence it is seen that the light is very intense in the mangrove swamp. In the inland jungle the undergrowth does not arrange its leaves so as to get the least light, but so as to get the most, *i. e.*, in a horizontal position.

The major part of the article is devoted to taxonomic descriptions, emphasis being laid upon the arrangement and character of the buds, branches, and leaves.

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[9] SCHMIDT, JOHS., Bidrag til Kundskab om Skuddene hos den gamle Verdens Mangrovetraeer. (Contribution to the knowledge of the shoots of mangroves in the old world.) Bot. Tidsskrift **26**:1–113. *figs. 46.* 1904.

No general uniformity exists in regard to the branching, although two general types may be separated: (1) the cymose, (2) the racemose. The leaves show considerable similarity in outline. Two type groups are made, the narrow leaved and the broad leaved type. The former type occurs only on species whose leaf-bearing branches are short and upright, while the broad leaves occur only on those whose branches are long.

In regard to protection of buds there is a considerable uniformity. Rhizophora, Bruguiera, Ceriops, Kandelia, and Scyphiphora are protected by means of axillary leaves which surround the developing parts; Aegiceras and Xylocarpus by means of true bud scales; Lumnitzera by red fleshy bud scales; Avicennia and Sonneratia by means of depressions in the leaf stalks. In comparison with northern trees, therefore, it will be seen that the majority of mangroves have buds similar to summer buds (Platanus), while Aegiceras and Xylocarpus correspond in this respect to the winter buds of northern latitudes.

The author criticises ARESCHOUG'S work on the anatomy of mangrove leaves,[10] in that the latter author has not studied the plants in nature and his theory that salt-secreting hydathodes are general among mangroves is not proven in nature. That salt-secreting glands do occur is definitely proven, but only in the one genus Aegiceras.—G. H. JENSEN.

THE FINAL paper of BLACKMAN'S studies on the fertilization, alternation of generations, and general cytology of the Uredineae has appeared,[11] presenting the subject more fully than the preliminary account which was reviewed in our April number.[12] We shall note at this time simply some additional details in this very clear and interesting paper.

The structure of the nuclei and processes of mitosis were studied, but it is evident that these subjects are very difficult. The chromatin remains for the most part in masses, so that chromosomes cannot be counted; but of course while there is but one mass throughout the gametophyte history from the teleutospore to the aecidium, there are two in the paired nuclei of the sporophyte. The nucleolus, always present, is extruded with each mitosis and formed anew in the daughter nuclei. A rudimentary spindle can sometimes be observed, with bodies at the poles which BLACKMAN calls centrosomes and which he believes arise by division, but his evidence seems insufficient on the latter point. The "conjugate" method of division of the paired nuclei only differs from that of single nuclei in the fact that two divide simultaneously side by side. The daughter nuclei remain entirely apart, so that the continuity of the chromatic material is not broken until the fusion in the teleutospore.

BLACKMAN points out the exact agreement of certain conditions in the Basidiomycetes with those in the Uredinales. Thus the mycelium preceding the basidium contains paired nuclei, which by fusion form a single nucleus in the mature basidium; the basidiospores are of course uninucleate, as is the mycelium that arises directly from them. Somewhere in the history of the mycelium the single nuclei must become paired. This will correspond exactly to the period of the aecidium in the life history of a rust, and must represent the time when an ancestral gametophyte developed sexual organs, now suppressed, and passed over to a sporophyte generation. The paired nuclei probably arise, as in the rust, by the union of neighboring cells in the mycelium, a process of apogamy, at the period when the sexuality is due.

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[10] Bibliotheca Botanica, heft 56.

[11] BLACKMAN, V. H., On the fertilization, alternation of generations, and general cytology of the Uredineae. Ann. Botany **18**:323–373. *pls. 21–24.* 1904

[12] BOT. GAZ. **37**:320. 1904.

It is important to note that the simpler types of life histories in the Uredinales where an aecidium is omitted must be regarded as derived from the *eu* and *opsis* forms by the entire suppression of cells which represent female sexual organs, and such life histories are in essential agreement with those of the Basidiomycetes which stand at the extreme in the process of reduction.—B. M. DAVIS.

JULES LAURENT[13] has given a detailed account of his experiments on the carbon nutrition of green plants. While the old humus theory was long ago abandoned, largely by reason of the work of LIEBIG, the tendency in recent years has been to hold to the utilization of organic foods to some extent, at least, by normal autotrophic plants. BÖHM, E. LAURENT, and ACTON have conducted rather conclusive experiments along this line, and a moderate amount of heterotrophic nutrition on the part of autotrophic plants is accepted by PFEFFER and JOST. The most conclusive experiments upon which this view may be based are those here considered, whose publication in full has been long awaited, since a preliminary notice was published in the Comptes Rendus for 1898. The chief reason for reposing confidence in LAURENT'S work is because he has worked with aseptic media, according to the most approved modern technique. Experiments with maize roots in contact with glucose solutions, in addition to DETMER'S solution, resulted in an increase of dry weight in the dark, whereas control cultures in DETMER'S solution only failed to show such increase in weight. MAZÉ has secured a like result with the vetch. Cultures in an atmosphere deprived of CO_2, but exposed to light showed an increase of weight due to an intake of glucose by the roots. Various plant species, previously deprived of starch, whose roots were placed in 1 to 5 per cent. glucose solutions, the plants being placed under a bell-jar, over a potash solution and exposed to sunlight, showed the formation of starch from glucose that had been taken in by the roots. Similar results were not obtained in darkness, perhaps because less glucose was absorbed. Autophytes are found to differ from saprophytes not only quantitatively, as appears from the above, but also more fundamentally. Careful experimentation failed to disclose any power on the part of the roots of green plants to digest starch, a power possessed by holosaprophytes. A chapter is devoted to the consideration of the influence of organic substances on growth and form. In general, stem growth is checked in concentrated solutions. While this is doubtless partly due to the increased osmotic pressure, it is evident that chemical factors are also active, since glucose and glycerin solutions of equal concentration give different results. A final chapter deals with the application of his results to agriculture.—HENRY C. COWLES.

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[13] LAURENT, J.: Recherches sur la nutrition carbonée des plantes vertes à l'aide de matières organiques. Rev. Gén. Bot. **16**: 14–48; 66–80; 96–128; 155–166; 188–203; 231–242. 1904.

KIRKWOOD[14] has published the results of an extended investigation of Cucurbitaceae, chiefly relating to the development of the ovary and the embryo sac structures. The genera included are Fevillea, Melothria, Apodanthera, Bryonopsis, Trichosanthes, Momordica, Luffa, Cucumis, Lagenaria, Benincasa, Citrullus, Cucurbita, Sicyos, Micrampelis, Coccinia, and Cyclanthera, a remarkable list for one investigator in these days to present in a single paper; but the work has been under way since 1898. The mass of details will always be consulted for comparison with similar details in other families, and it is important to have so compact and clear a record. Certain general results, however, should be referred to even in a brief review. As is well known, the position of the family has always been a problem because of its contradictory characters, but it is generally placed now among the higher Sympetalae. It is interesting to note that Kirkwood has discovered that the sixteen genera studied unanimously contradict certain characters of Sympetalae that have been thought to be fundamental. The ovule of this great group is remarkably constant in its single and very prominent integument, its very much reduced nucellus, and its elimination of tapetal tissue (the hypodermal archesporial cell passing over directly into the mother-cell). In all the Cucurbitaceae studied, however, Kirkwood finds the ovules with two integuments, a well-developed nucellus, and tapetal tissue by no means eliminated, but often very extensive. It seems to the reviewer that just as the single character of polypetaly, arbitrarily applied, has detained the Umbelliferae among the Archichlamydeae, so the single character of sympetaly has forced the Cucurbitaceae among the Sympetalae. The synergids are remarkable for their prominence and structure, and the antipodals are ephemeral. Material did not permit a study of the peculiar pollen tubes reported for the family, or of fertilization and the development of the embryo. The endosperm is noteworthy for its extensive growth and nutritive activity, to which the author has given somewhat detailed attention. The general conclusions from the development of the ovary, especially the growth of the variable "placenta" and the origin of the ovules, are used in an interesting way to relate the genera in phylogenetic series.—J. M. C.

FITTING'S[15] preliminary report promises a paper which will be of special interest because he has attempted a solution of several of the most fundamental problems of geotropism. The behavior of orthotropic organs upon a klinostat so arranged that the rotating plant describes a cone whose axis is inclined to the horizontal leads him to announce the following statements. The optimum position for geo-perception is horizontal and equal responses are induced by equal deviations above and below the horizontal. (In a recent paper NEWCOMBE[16] finds that roots and stems do not receive equal stimuli at equal angles above and below the horizontal.) The minimum perception time is extremely brief, less than two-thirds of a second. A proportionality between reaction time and perception time does not exist. Orthotropic organs can be geotropically stimulated even though the rotation be very rapid and uniform. There is a threshold-difference not only for intensity of stimulation but also for duration of stimulation, and for position during stimulation (deviation from horizontal). Intermittent is much less effective than continuous stimulation in the induction of geotropic curvatures. The response is little affected by the duration and number of individual stimulations. The presentation time is never smaller than for continuous stimulation, and is practically the same as for the latter when the ratio of stimulus duration to rest duration is as small as 1:5. The duration of single stimuli is without influence upon reaction time so long as the ratio of rest duration to stimulus duration does not exceed 5:1. Nothing was observed which would support HABERLANDT'S statolith hypothesis.—RAYMOND H. POND.

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[14] KIRKWOOD, JOSEPH EDWARD, The comparative embryology of the Cucurbitaceae. Bull. N. Y. Bot. Garden. **3**:313–402. *pls. 58–69.* 1904.

[15] FITTING, H., Geotropische Untersuchungen. (Vor. Mit.) Ber. Deutsch. Bot Gesells. **22**:361–370. 1904.

SPINDLE FORMATION in the pollen mother-cells of *Cassia tomentosa* L. has been studied by HUS,[17] who finds that the cytoplasm of the young pollen mother-cell consists of a network of fibers more or less radially arranged, on and between which large and small granules are found. The meshes adjacent to the nuclear wall become smaller and elongated parallel to that wall. A granular zone appears around the nucleus; and at the same time there appears in the cytoplasm deeply staining rough fibers frequently arranged in conical groups. A felt-like zone, partially or sometimes completely surrounding the nucleus, next appears, and the deeply staining rough fibers of the cytoplasm, now united into cones, establish connection with the fibers of the felt-like zone. The linin threads become parallel with the other fibers and also parallel with the axis of the larger or ascendant cone. As soon as the rough threads of the fibers become smooth, the nucleolar wall breaks down, the linin and the kinoplasmic fibers anastomose and become grouped into bundles. A multipolar spindle is formed, two cones of which, opposite to each other, are more prominent and gradually absorb the smaller cones. The spindle of the second division is more pronouncedly multipolar than that of the first division. HUS concludes that "the spindle formation in *Cassia tomentosa* L. forms a connecting link between the multipolar polyarchal spindle *Anlage* ordinarily met with in dividing mother-cells of pollen, spore, and embryo-sac, and the multipolar diarchal spindle *Anlage* described for vegetative cells."—W. J. G. LAND.

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[16] NEWCOMBE, F. C., Limitations of the klinostat as an instrument for scientific research. Science **20**:376–379. 1904.

[17] HUS, HENRI T. A., Spindle formation in the pollen mother-cells of *Cassia tomentosa* L. Proc. Calif. Acad. Sci. III. **2**:329–354. *pls. 30–32.* 1904.

LANG[18] has described in detail the single prothallus that he refers provisionally to Psilotum; otherwise the gametophyte of Psilotaceae is entirely unknown. During his expedition to the Malayan peninsula, LANG found a number of plants of Psilotum growing on the stems of tree ferns, with rhizomes embedded among the adventitious roots covering the stems. In close association with one of these plants the single prothallus referred to was found. A preliminary account of its external form was published in 1901. It is thick cylindrical, about 6^{mm} long and 4.5^{mm} in diameter at the broad upper end. It shows the usual differentiation of the subterranean gametophytes of Lycopodium into vegetative region below and sexual region above. The latter appears as a thick overhanging margin in which numerous antheridia occur. The sexual region does not contain chlorophyll, as in the *Lycopodium cernuum* type, the gametophyte evidently being entirely saprophytic. The vegetative region exhibits considerable histological differentiation, an endophytic fungus occupying a peripheral zone, and the central mass of tissue being entirely free from it. Some very interesting details in reference to the fungus are given, especially the occurrence of some remarkable multinucleate "vesicles" borne upon it. If this gametophyte is that of Psilotum, the genus is closely related to the homosporous Lycopodiales; if it is not, it is certainly the gametophyte of some Lycopodium.—J. M. C.

IN A RECENT number of *Science* MORGAN[19] attempts an analysis of the phenomena of organic "polarity." He opposes the "formative stuff" hypothesis of SACHS and others, or rather that feature of it which calls for the migration of specific formative material, and arrays considerable evidence against it. MORGAN'S conception is that while the material which gives rise to new parts is totipotent, it is not homogeneous, so that it is different at different levels of the body, this difference being graded from one end of the organism to the other. This accounts for the gradation in the facility with which new parts are formed from one end to the other. Morgan also recognizes an organizing principle, which he calls the property of "formative organization," "which acts on the new and old parts as a whole and determines the relative arrangement and proportions of the new organs."

In regard to "polarity" in plants Morgan maintains that these same principles hold. Assuming that there is a gradation from the distal to the proximal end of say, a mullen stem, in the size and vigor of the buds, the greater ability to produce shoots at the distal end is due merely to the fact that these buds are more vigorous and mature. The suggestion is made that the opposite may be true of the roots.—W. B. MCCALLUM.

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[18] LANG, WILLIAM H., On a prothallus provisionally referred to Psilotum. Ann. Botany **18**:571–577. *pl. 37*. 1904.

[19] MORGAN, T. H., An analysis of the phenomena of organic "polarity." Science **20**:712–748. 1904.

IN A COMMUNICATION to the Royal Society December 1, SCOTT[20] described a new type of strobilus belonging to the Sphenophyllales. The close affinity to Sphenophyllum is shown by the anatomy of the axis, which has the solid triarch wood characteristic of that genus, and by the fact that the whorled sporophylls are divided into dorsal and ventral lobes, as in all other known fructifications of this class. But, whereas, in all the forms hitherto described the lower or dorsal lobes are sterile, forming a system of protective bracts, while the ventral lobes alone bear the sporangia; in the new cone, dorsal and ventral lobes are alike fertile, and no sterile bracts are differentiated. Each lobe of the sporophyll divided palmately into several segments, the sporangiophores, each of which consisted of a slender pedicel, terminating in a large peltate lamina, on which two pendulous sporangia were borne. The wall of the sporangium has a rather complex structure, the most interesting feature in which is the well-defined small-celled stomium, marking the line of longitudinal dehiscence. The spores, so far as observed, are all of one kind; they are ellipsoidal in form, with longitudinal crests or ridges; their dimensions are 90–96 μ in length by 65–710 μ in width.—J. M. C.

THE COMMON *Ithyphallus impudicus*, generally considered to be a saprophyte only, has been found to be the cause of a destructive root rot of the vine in Hungary. According to the account given by ISTVÁNFFI[21] the subterranean part of the stem is entwined by a network of the characteristic cord-like strands of mycelium of this fungus. From these, branches are sent into the interior of the stem. Small roots are totally destroyed by strands which penetrate them lengthwise, destroying all the tissues and leaving only the thin decaying cortex. In the older roots the cortex and phloem are totally destroyed, leaving only a mass of débris. The wood cylinder is last attacked, but this also is finally destroyed, leaving only scattered remnants of the vessels. Destruction of the immature fruit-bodies and watering the exposed roots with fungicides is recommended as a means of prevention.

The same paper also contains an account of a mite, *Coepophagus echinopus*, which lives within and destroys the tissues of the roots of the vine. Not infrequently vines are attacked by both pests at the same time.—H. HASSELBRING.

SVEDELIUS[22] has published an account of *Enalus acoroides*, one of the marine Hydrocharitaceae growing on the coast of Ceylon; the subtitle being "A contribution to the ecology of the hydrophilous plants." The pollen grains are very large (about 170 μ in diameter) and heavier than sea water, owing to the presence of numerous starch grains. The wing-like leaves of the ovulate spathe aid in keeping the flower in a horizontal position, and the petals are specially adapted to catch the floating staminate flowers. The exposure of the ovulate flowers and the loosening of the staminate flowers occur only during low water. During high water the ovulate flowers are vertical; and the heavy pollen grains can scarcely avoid sinking down upon the erected stigmas. The pollination of Enalus, therefore, is both at the surface of the water and beneath it. The development of the embryo is of the ordinary Alisma-type, with a very large basal suspensor cell. At maturity the testa is an easily loosened cap around the embryo, the latter escaping entire and developing immediately.—J. M. C.

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[20] SCOTT, D. H., On the structure and affinities of fossil plants from the Paleozoic rocks.—V. On a new type of sphenophyllaceous cone (*Sphenophyllum fertile*) from the Lower Coal-measures. Read December 1, 1904.

[21] ISTVÁNFFI, GY DE, Deux nouveaux ravageurs de la vigne en Hongrie (l'*Ithyphallus impudicus* et le *Coepophagus echinopus*). Ann. Inst. Cent. Ampélologique Roy. Hongrois **3**: 1–55. *pls. 1–3. figs. 15.* 1904.

[22] SVEDELIUS, N., On the life history of *Enalus acoroides*. Ann. Bot. Gard. Peradeniya **2**: 267–297. *pl. 24.* 1904.

LOCK[23] has been investigating the rate of growth of the giant bamboo (*Dendrocalamus giganteus*) in Ceylon. The stems show a gradually increasing rate of growth up to 5^{m}; then a nearly constant rate up to 15^{m}; then a slowly diminishing rate to the final height of 30^{m} or more. The average daily rate at a height of 1^{m} is 10^{cm} per day; at $5–15^{m}$, 30^{cm}; and at $20–25^{m}$, 15^{cm}. The greatest growth recorded in 24 hours was 46^{cm}. The daily rate of growth is much increased by rainfall, the effect being greater the greater the height of the stem. The greatest change observed in rate of growth in two successive days was 50 per cent. of the average rate. Growth is almost always more rapid at night; the average hourly growth at heights of $3–12^{m}$ between 7:00 A.M. and 5:00 P.M. being 6^{mm}, and between 5:00 P.M. and 7:00 A.M. 16^{mm}; the maximum rate being reached soon after dark. The curve of growth by day follows very closely that of the percentage moisture of the air.—J. M. C.

THE SECOND section of DAVIS'S[24] *Studies on the plant cell* is entitled, "Activities of the plant cell." The activities described are (1) vegetative activities, and (2) cell division. Cell division is treated under the subheads (*a*) the events of nuclear division and (*b*) the segmentation of the protoplasm. The account of mitosis in the thallophytes is particularly clear. The origin of the spindle is discussed in detail and considerable attention is paid to the centrosome problem. The view is expressed that all divisions of chromosomes are longitudinal. The evidence in favor of regarding the chromosome as a permanent organ of the cell is regarded as not yet sufficient. In dealing with the segmentation of the protoplasm, the author gives a valuable summary of recent work in this field. —CHARLES J. CHAMBERLAIN.

BURNS[25] concludes that in *Proserpinaca palustris* L. the water-environment is not the cause of the division of the leaf. He considers that the plant has two types of leaves, an adult and a juvenile type, the latter being the divided form. Under good vegetative conditions the former is produced, while under poor vegetative conditions the juvenile form is developed. A reversion from the adult to the juvenile form follows a change from a favorable to an unfavorable vegetative condition.—W. B. McCALLUM.

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[23] LOCK, R. H., On the growth of giant bamboos, with special reference to the relation between conditions of moisture and the rate of growth. Annals Bot. Gard. Peradeniya **2**:211–266. *pls. 21–23.* 1904.

[24] DAVIS, B. M., Studies on the plant cell. Amer. Naturalist **38**:431–469. *figs. 4–8.* 1904.

[25] BURNS, G. P., Heterophylly in *Proserpinaca palustris* L. Ann. Botany **18**: 579–605. *pl. 38.* 1904.

LLOYD[26] calls attention to the parallelism between the results of his studies of the pollen tubes in the Rubiaceae and those of LONGO in the Cucurbitaceae. Each of these investigators has found that the pollen tubes vary greatly in behavior, even in closely related genera or species. They seem to have come independently to the same conclusion; that is, that endotropism and ectotropism are not distinct from one another; both regard the behavior of the pollen tube as a physiological character.—R. B. WYLIE.

WRIGHT[27] has published an extended account of the gross morphology, anatomy, and taxonomy of Diospyros as represented in Ceylon. The family is of such interest among dicotyledons that so extensive a study of living material is welcome. In the taxonomic portion of the paper twenty species are recognized and described in great detail.—J. M. C.

STUDENTS of plant-breeding will be interested in the results obtained by LOCK[28] in conducting a somewhat extensive series of experiments in Ceylon. In his first paper the details of the experiments indicate in the main a confirmation of MENDEL'S law.—J. M. C.

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[27] WRIGHT, HERBERT, The genus Diospyros in Ceylon: its morphology, anatomy, and taxonomy. Annals Bot. Gard. Peradeniya **2**:1–106, 133–210. *pls. 1–20.* 1904.

[28] Lock, R. H., Studies in plant-breeding in the tropics. I. Ann. Bot. Gard. Peradeniya **2**:299–356. 1904.